

28. AirTouch Paging and Arch cannot favor total preemption. Because of the substantial impact that portability requirements will have on local and intrastate service, the state commissions have a legitimate statutory interest in this issue. Most important, the states have gained valuable experience in the course of their portability trials that should not be lost. Moreover, the industry can ill afford the protracted legal battle that could ensue if the FCC takes too heavy-handed an approach with preemption.

29. On the other hand, the Joint Commenters cannot advocate giving the states a free hand to implement any portability scheme they want without regard to a uniform technical standard. Mobile telephone and paging service territories do not conform to state boundaries, and it would be intolerable for a single wide-area wireless system to be subject to incompatible interim or permanent portability schemes in multiple jurisdictions. Any such result would harken back to the days when the development of efficient regional wireless systems was hindered by the patchwork of inconsistent and often burdensome state certificate requirements to which radio common carriers were subjected.

30. AirTouch Paging and Arch note that companies with a recurring presence before state agencies are more likely to ask the FCC to show greater deference to the states.<sup>17/</sup> However, a substantial portion of entities that would be affected by

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<sup>17/</sup> E.g. MCI, TDS.

portability have no ongoing participation in state commission matters. The pro-competitive benefits of portability could easily be eradicated if new entrants are burdened with having to participate in state portability proceedings across the nation to protect their rights.

31. On balance, AirTouch Paging and Arch are convinced that the best approach is for the FCC to establish specific uniform technical standards and broad implementation guidelines, and to limit the role of the states to the "nuts and bolts" of implementation within the scope of the federal mandate. Again, the Joint Commenters urge the Commission to be specific about what the states can and cannot do. This will avoid turf battles in which carriers are caught in the middle.

#### **VIII. Portability Plans Compared and Contrasted**

32. Several specific portability plans have been presented for consideration in this proceeding, including proposals of AT&T, MCI, GTE and U.S. Intelco. AirTouch Paging and Arch asked Jubon Engineering to evaluate these plans, with particular attention to their impact on CMRS providers. The comparison can be found in pages 17 to 24 of the Jubon Memo. The following key conclusions are reached:

a. There are common elements to the four plans arising from the fact that each, in one form or another, requires the disassociation of personal addresses and physical addresses.

The result is that each of the plans provides an increased degree of number portability, but not without engendering many concerns.

b. SS#7 is the enabling medium, which requires that careful attention be given to isolating or accommodating the lesser capabilities of most of the installed CMRS switches in wireless networks.

c. The MCI plan has a potential limitation in its ability to handle multiple exchange service providers serving multiple area codes within the same portability domain. Also, the use of "residual" numbering resources for local area physical address emulation was evaluated to be less than optimal.

d. GTE's plan, while workable, contradicts a basic tenet of portability by requiring a user to change to a new number to enjoy portability on a going-forward basis.

e. The U.S. Intelco plan consumes two NANP telephone numbers for each ported user, which cannot be justified in a network environment where numbers are becoming increasingly scarce.

f. On balance, the AT&T plan presents a suitable long-term solution, subject to the important caveat that substantial work must be done to standardize the implementation regime, with special attention to the unique circumstances surrounding wireless networks.

**Conclusion**

The foregoing premises having been duly considered,  
AirTouch Paging and Arch respectfully request that the Commission  
pursue telephone portability with due regard for the foregoing  
reply comments.

Respectfully submitted,

**AIRTOUCH PAGING  
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October 12, 1995

121638.01

## **ATTACHMENT 1**

## **Jubon Engineering, P.C.**

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### **Jan David Jubon, P.E. - Biographic Sketch:**

Jan David Jubon is a registered professional engineer specializing in wired and wireless telecommunications.

His engineering/professional tenure began with Bell Telephone Laboratories, and advanced through New Jersey Bell to AT&T as Engineering Staff Specialist, advising the Bell Companies on both radio and switched network aspects of mobile services.

In 1974, Mr. Jubon moved to Motorola's Common Carrier Products organization with responsibilities for network compatibility issues, the initial design concepts for Motorola's EMX digital cellular switching systems, and representing Motorola's cellular telephony interests to overseas telecommunications administrations.

Based in New Jersey, Mr. Jubon entered private consulting engineering practice in 1977. In early 1990, he merged his individual practice, Jubon Engineering, Inc. into the Washington, D.C. area firm of Moffet, Larson and Johnson, Inc. After a major change in that firm's ownership, and short, specialized, senior engagements with two other Washington-based firms, Mr. Jubon, in late 1993, reopened his own firm and relocated to Atlanta, Georgia.

As a consultant, Mr. Jubon has designed or advised on many of the technical, operational, economic, administrative, and regulatory aspects of both wired and wireless telecommunications systems worldwide. His work embraces the creation and administration of standards and functional criteria appropriate to effective, efficient, and economical deployment and operation of both wireless and conventional wire-based exchange and interexchange services within the public switched telephone network. His wireless work includes in-depth participation in propagation, radio coverage, administrative and licensing issues. In addition, he participates regularly in the development and defense of related court and regulatory proceedings, and is a member of a US Department of Commerce Technical Advisory Committee.

Mr. Jubon holds a Bachelor of Science Degree in Electrical Engineering, Summa Cum Laude, from Newark College of Engineering (now known as New Jersey Institute of Technology), and is a member of the engineering honor societies Eta Kappa Nu and Tau Beta Pi. He is a Licensed Professional Engineer in six states and the District of Columbia, is registered with the National Council of Examiners for Engineers and Surveyors (NCEES), and holds FCC General Radio Telephone Operator and Amateur Extra Class Licenses. Also, he is a member of the Association of Federal Communications Consulting Engineers, a senior member of the IEEE, and a fellow of the Radio Club of America.

## **ATTACHMENT 2**

# **Jubon Engineering, P. C.**

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## **TECHNICAL MEMORANDUM**

### **An overview of selected technical issues regarding telephone number portability, with considerations applicable to CMRS/wireless exchange service providers**

#### **Executive summary:**

This overview of selected issues regarding telephone number portability examines some of the more prominent considerations in evaluating the potential benefits and viability of telephone number portability in both the conventional, wireline-based PSTN, and in the evolving wireless/CMRS (Commercial Mobile Radio Service) exchange service provider manifestations within the PSTN, as represented by the "Notice of Inquiry" and Commenters in FCC CC Docket 95-116.

Inclusion of CMRS providers in interim portability measures is at best cumbersome and potentially costly, does not appear to serve a demonstrated need, and is not recommended. CMRS/wireless providers should be included only in a permanent plan. Integration of CMRS services within a long term, national standard number portability plan awaits definition by the regulators and industry of that standard and development of functionalities meeting that definition. CMRS roaming, fraud-control, and 9-1-1/E-9-1-1 compatibility may require special consideration in number portability.

The AT&T LRN plan appears suitable, with caveats, for long term number portability for both LEC providers and CMRS providers. The MCI and US Intelco plans both are less efficient with regard to NANP resource use than the AT&T plan. The GTE plan contradicts the basic tenet of portability, number retention, by causing a user to change numbers at the outset.

Interim LEC number portability must function without adversely affecting CMRS operations or CMRS-PSTN interworking. Continued use of switch based, RCF-derived pseudo-portability is suggested as the best compromise "interim solution" for LEC portability based upon adverse consequences for some CMRS and small LEC providers caused by SS#7-based interim LEC portability solutions.

Jan David Jubon, P. E.  
10 October 1995



## **TECHNICAL MEMORANDUM**

**An overview of selected technical issues regarding  
telephone number portability, with considerations  
applicable to CMRS/wireless exchange service providers**

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**Introduction:**

Background:

Heretofore, an NANP telephone number represented a particular physical and electrical destination in the North American public switched telephone network (PSTN). A small degree of "location portability" existed for numbers whose otherwise fixed destination was within the geographic area circumscribed by a wire center's serving boundary, and served by a single local exchange switching entity. Since, historically, telephone service was supplied in a monopoly environment, the concept of number portability between service suppliers or between different services was unheard of.

With the introduction of long distance competition, and extension of that competition into "800" toll-free services, the FCC mandated both full service provider portability and nationwide location portability of 800 numbers. "800 numbers" (and soon 888) also define an unique service different from POTS (Plain Old Telephone Service). 800 numbers are toll-free to the caller, and are non-geographic. That is, there is no algorithmic correlation between a ten-digit 800 number, or any subset of it, and the service provider to or locality of the subscribing end user of that number.

Extension of the concepts of service provider portability and ubiquitous location portability from "800 numbers" to POTS requires much more than just adopting and adapting 800 technology to geographically-fixed based telephone numbers. This is especially true in the case of wireless/CMRS (Commercial Mobile Radio Service) exchange service providers which use presently geographically fixed telephone numbers to provide, through adaptation, a dynamic-geographic telecommunications service.

This document examines some of the more prominent considerations in evaluating the potential benefits and viability of telephone number portability in both the conventional wireline-based switched network, and in the evolving wireless/CMRS manifestations of the PSTN, as represented by the Commenters in CC Docket 95-116.

**Important basic concepts and definitions:**

"Telephone number" defined:

The issue of "telephone number portability" and the dimension of its impact both on the public and the telecommunications industry revolves entirely around a useful, working definition of what constitutes a "telephone number". As the FCC has noted in ¶7 of its "Notice of Proposed Rulemaking" in CC Docket No. 95-116 (released 13 July 1995)

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(hereinafter "Notice"), "Telephone numbers in the United States consist of ten [10] digits, as required by the NANP." (North American Numbering Plan) It is this definition which is embraced in this document.<sup>1</sup>

Portability domains:

The basic administrative and operational concept for number portability revolves around what, for purposes of this paper, is called a portability domain. A portability domain is simply a geo-physical region within which full server and location number portability can function ubiquitously.

Physical addresses:

One important concept in understanding and evaluating any number portability plan is the necessary recognition of a distinction between a "network physical address" (hereinafter "physical address"), and a "NANP-type ten-digit 'personal address'" (hereinafter "personal address").

A "physical address", as used herein, is not yet formally defined in the North American PSTN or in SS#7. However, definition is not difficult. A physical address must uniquely identify an originating and/or terminating point, generally an end office switching entity, for switched traffic traversing the PSTN.

Personal addresses:

The "Physical addresses" definition, above, refers to a "NANP-type ten-digit 'personal address'". A personal address is the "telephone number" one dials to call another party. Note that the term "personal" can mean associated either with an individual person or with a business identity. Within this paper, "personal addresses" utilize the familiar NPA-NXX-XXXX format of conventional North American Numbering Plan numbers.

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<sup>1</sup> Some of the "Comments" filed in this Docket appear to be effectively based upon the assumption that one's "telephone number", and thus the number to be considered "portable", consists only of the seven digits comprising the three (3) digit central office (NXX) code and four (4) digit line number. Those Commenters' definitions, therefore, to at least some extent exclude for separate treatment, usually as a given constant, the three (3) digit Numbering Plan Area (NPA) code, a/k/a the "Area Code", which the Commission has already recognized is an important, integral part of one's "telephone number".

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**Operating considerations:**

Evaluating and commenting upon proposals for telephone number portability flows most sensibly by looking first at the desired final result, and from that plotting a carefully crafted, coherent, and economical course from the present to the future. Thus, this paper will first briefly overview the present and future, and then under that framework, address concerns in evolving true interim solutions awaiting deployment of the long term architecture.

Present situation:

By way of summary, the "present" "state-of-the-portability-art" is essentially RCF (remote call forwarding) and Flex-DID (another form of RCF; RCF and Flex-DID will be generically referred to as "RCF"). In terms of basics, RCF is undeniably makeshift and cumbersome, besides being less than optimal technically or economically. Further, RCF arrangements definitely are temporary and, at present, do not include CMRS within the RCF portability domain. Consequently, viewing RCF from the wireless/CMRS (hereinafter collectively "CMRS") perspective, there has been no overt reason for CMRS providers to become concerned with RCF manifestations of portability.

Standards for the future:

Conceptually for the future, a single, national standard portability-enabling network architecture should be forged. Such a structure should be capable of being implemented in a phased manner, both for exchange service providers within a region and region-by-region. The principal attribute which such a plan must possess is an inherently "level" competitive playing field while not also inviting an economic disaster or administrative nightmare. Accordingly, the chosen architecture must pro-actively address the needs and desires of not only the BOC-LEC, I-LEC (Independent LEC), and C-LEC (Competitive LEC) exchange service providers/competitors; the architecture selected must with equal pro-activity address the needs and desires of all CMRS exchange service providers, whether or not such a provider directly participates or is required to participate in inward and/or outward portability of CMRS numbers.

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**Long-term portability proposals, overview:**

Commonalities and considerations in general:

Evaluation of the four principal "permanent"/"long term" number portability plans discussed in the Docket 95-116 Comments submissions<sup>2</sup> produced the general conclusion that the plans have significant commonality.

Each plan, in one form or another, requires the use of separately defined personal addresses and physical addresses. Separate personal and physical addressing denotes the necessity of being able to map any in-domain personal address to and from any in-domain physical address. Due to the sheer volume of data, the mapping process must be database driven. As such, any of the plans must be implemented in an environment supportive of rapid data transfer and interpretation for translation and routing of calls. SS#7 is the enabling medium. Location portability, except in the GTE proposal, was to be bounded by domains generally described to be about the size of a state and inclusive of multiple NPAs. As will be detailed later, the plans differ on the exact nature of, and therefore on the placement within the network and in the chronology of, particular call processing steps.

While each of the plans provides an advanced degree of number portability, each of the plans also engenders many of the same concerns. Moreover, these concerns reflect shortcomings which often affect the entire breadth of the exchange service provider industry.<sup>3</sup> In many cases, it is not relevant whether or not all exchange service providers

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<sup>2</sup> These are ...

- "LRN" (Location Routing Number) plan - AT&T
- "CPC" (Carrier Portability Code) plan - MCI
- GTE segregated, dedicated code approach
- "Seattle plan" - US Intelco, Stratacom

<sup>3</sup> The exchange service provider industry circumscribes ...

- BOC-LECs (The BOC telephone companies)
- I-LECs (Traditional independent wireline telephone companies)
- C-LECs (Competitive wireline telephone companies)
- CMRS/wireless paging companies
- CMRS/wireless conventional two way companies, including SMR
- CMRS/wireless cellular companies, including ESMR
- CMRS/wireless PCS operators.

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participate or are required to participate in number portability. Therefore, even if CMRS does not directly participate in number portability, incompatibilities for CMRS providers can and will affect suitability of a plan for an interim arrangement awaiting development of the longer-term solution. In fact, on many occasions CMRS exchange service providers will be/are saddled with some added degree of adversity due in large measure to the inherently more complicated nature of addresses and addressing in mobile communications, and a history of network interconnection arrangements and prerogatives different from, and in some cases significantly inferior to, those utilized with other exchange service providers.

Technical considerations relevant to meaningful evaluation of several of the more prominent areas of concern in implementing number portability are discussed briefly below. Following the discussions of concerns, each of the four plans is compared for suitability in both long term and interim deployment in the domestic exchange service arena which includes both LEC/wireline and CMRS/wireless competitors.

Dimensions of customer number portability:

Unless and until a long-term number portability approach has been chosen, developed, and installed, and with it, a "final" definition of the breadth of area through which a telephone number can be considered portable, ordinary interim POTS number portability is generally considered as being constrained to only service provider portability, in a single fixed location. Conceptually, one may draw a parallel to the C-LEC industry sector making photocopies of the incumbent BOC-LEC/I-LEC exchange area definitions, with location portability limited to the extent of each extant exchange area.

Ultimately, the long term number portability solution may be required to provide some degree of location portability, if only to address the fact that in a truly competitive marketplace, competing carriers should generally not want to be tied to the incumbent's business decisions and limitations vis-à-vis "exchange area" boundaries, extent of local calling, extent of competitive portability, or extent of service areas. The gross geo-physical limitations for number location portability are established in definition of portability domains and are discussed in the next section.

Portability domain boundaries:

This discussion of portability domain boundaries is intended to articulate the considerations that should ultimately frame the issues surrounding true, long term telephone number location portability solutions. Understanding these considerations is relevant even though the Comments filed in response to specific inquiry in the Notice reveal no significant constituency currently favoring wide scale location portability.

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For number portability to be an effective tool in competition, above all else portability must be an economically and administratively reasonable proposition. Choice of appropriate dimensions for, and the ability to customize and, if necessary, adjust the dimensions of a portability domain,<sup>4</sup> are important influences on that reasonability. It is submitted that the FCC should, in concert with the industry and states, establish and continue to oversee portability domain boundaries.

A portability domain must be large enough to embrace a complete "market area" and give all consumers equal opportunities to use the number portability feature. A portability domain should not be so large that administration becomes overly cumbersome, nor should the extent of the domain invite disparate regulatory treatment for the same numbers and services in different parts of the domain.

The inclusion of rural number portability within a domain is more important than simply equal competitive and consumer opportunity. Portability of numbers to/from rural areas can provide critical, and often sizeable, numbering relief to the more populous areas and area codes within that domain.

Geographic boundaries, whether statistical such as MSAs, RSAs, MTAs, or BTAs, or regulatory such as exchange areas, LATAs, or NPAs (telephone area codes), or political divisions and subdivisions, all contribute to, but cannot individually control definition of the extent of a portability domain. Of course, domain boundaries should be designed to coincide with as many of these other boundaries as possible. However, NPA, LATA, and exchange area boundaries become almost irrelevant to domain boundaries in a properly configured location and service provider number portability regime. But, as noted above, configuration of a domain should not invite regulatory disparity within the domain. Taken all together, the least common denominator for domain boundaries appears to be state lines.<sup>5</sup>

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<sup>4</sup> i.e.: changing the limit of location portability for a portability domain which in turn defines the breadth of numbers circumscribed.

<sup>5</sup> While this report may be interpreted to endorse state and domain boundary coincidence, there is no intention of discouraging establishment of smaller or larger domains, or interstate or even interdomain (possibly limited in scope) number portability where a reasonable need exists. The New York City, Northern New Jersey, Southwestern Connecticut region is one possible example of a candidate area for interdomain portability. Also, there may be other areas, perhaps the State of California, where two portability domains within the state rather than a single statewide domain might prove easier to administer, conform closely to actual, wholly distinct and separable communities of interest, and be no detriment to full competition and consumer choice.

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Unfortunately, uniformly available location portability virtually demands overlaying all NPA codes within each domain. Thus, locality recognition by telephone number will dissipate as portability features are exploited. Conversely, state identities will remain tied to specific area codes.<sup>6</sup> Attempting to confine location portability to area code boundaries does not address the multi-NPA character of many markets, such as Atlanta, Chicago, or Los Angeles, and at best only is effective until an area code exhausts and is to be split, at which point one is forced to either overlay or halve the region of portability consumers enjoy.<sup>7</sup>

Number management agencies:

Commenters generally concur that both physical addresses and personal addresses are numbering resources which need to be allocated, administered, and deployed without discrimination or prejudice among the universe of telecommunications exchange service providers.

Ideally, an individual number management agency would administer personal address number availability and deployment within each portability domain. Using a single agency structure, similar to the 800/888-SMS (Service Management System) provider, requires that agency to have an objective, "arms'-length" relationship to all service providers utilizing its services.

"Larger" domains may be able to support "quasi-competition" in personal address number management, still at arms'-length with the service providers, among a plurality of number management agencies.<sup>8</sup> In any situation with multiple agencies, the scope of each agency's task and control must be clearly delineated. Any divided/shared responsibilities must be carefully and continuously scrutinized.

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Or, possibly as may be appropriate for the Washington DC metropolitan area, a multi-state domain may be the correct configuration to consider.

<sup>6</sup> For example, Georgia telephone numbers would still begin with 404+, 706+, 770+, or 912+ although numbers within the city of Atlanta might begin with a code different from 404+ or 770+.

<sup>7</sup> See also Comments of BellSouth at pages 11 and 12.

<sup>8</sup> For example purposes only, one division of responsibilities between competing agencies could rest upon each area code used within a portability domain.



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Objective number management is also needed for physical addresses. Unlike personal address administration which will daily require thousands of transactions, the need to add, change, or discontinue a destination code occurs only upon installation, modification, or removal of end office switching entities. Therefore, in terms of daily involvement, and nation-wide scope of applicability and code assignment uniqueness, physical address administration may be more closely related to Numbering Plan Area (NPA, area code) assignment and maintenance, and might be effectively handled by the same agency which will perform area code administration functions. Individual line activity within a switching entity/physical address is embraced within administration of personal addresses.

Users should not be expected to deal directly with the personal address management agency(ies). End user requests for special/vanity number assignments should be handled by the exchange service provider through which service is being arranged. As with 800/888, number availability should be first-come-first-served. In the event of moving a personal address from one exchange service provider to another, the management agency ideally should require confirmation of the change order from both competitors as a safeguard to the public's interest.

All CMRS providers will necessarily be interacting with address management agencies whether they are required to participate in number portability or not since the management agencies will be the source and controllers of number availability.

**SS#7 deployment implications:**

It is simultaneously an understatement and overstatement that the SS#7 signaling system facilitates any of the number portability plans under consideration. Precise definition, development, and testing of a complete standard suite of SS#7 message and transaction protocols and formats will certainly be required before any long term portability plan can become reality. The SS#7 information suite must (a) incorporate address content standards, (b) optimize interworking with CMRS as well as LEC providers, (c) optimize interworking with the CMRS's IS-41, et. al., standards which have no real parallel in the wireline industry segment, (d) efficiently and economically handle non-SS#7-equipped LEC and CMRS end offices (at least over the short term), and (e) affirmatively address the possibility that certain classes of exchange service providers may not be subject to a legal/regulatory requirement to accommodate portable numbers.

Besides the obvious economic efficiencies of scale and direct interworking of equipment supplied by competing vendors, standardization enables direct, competitive, non-bottlenecked interconnection between any two exchange service providers, or between any exchange service provider and any interexchange service provider, or between any

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combination of exchange and interexchange service providers, of course consistent with network architecture standards.

Once the development cycle is complete, the relevant network upgrades must be economically and non-disruptively retrofitted into the existing SS#7 equipment base as well as being included in all new equipment production. Compatible SS#7 modifications will be needed for upgradeable equipment, and some extant switches will simply need to be replaced.

CMRS Type 2B trunking limitations:

More particularly to CMRS, providers utilizing direct, Type 2B,<sup>9</sup> high usage CMRS end office to/from "x"-LEC end office inter-local (in a by-gone era called "5-5") trunking will be forced, under all except the GTE number portability proposals,<sup>10</sup> to either equip their CMRS end office (a/k/a MTSO, MSC, WSC) with SS#7 capability or to re-route all inter-local traffic, whether or not it is currently directly-trunked, through a bottleneck SSP-equipped "tandem facility".<sup>11</sup>

Particularly if CMRS is not required to participate in number portability, it may be economically unattractive to equip a wireless end office (MTSO/MSC/WSC) for SS#7 in order to be able to continue to take advantage of the lower rates and shorter call delivery

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<sup>9</sup> CMRS exchange service providers interchange traffic with the PSTN using interconnecting facilities described in Bellcore Document TR-NPL-000145. Those facilities are characterized by a "Type" designation ...

- Type 1 - Network interconnection through an LEC end office
- Type 2A - Network interconnection through a tandem
- Type 2B - Interconnection to a particular end office switching entity
- Type 2C - Interconnection to a public safety emergency reporting system
- Type 2D - Direct operator services interconnection
- Type S - SS#7 A-link interconnection

<sup>10</sup> The GTE portability proposal requires only calls to one of the (reserved) non-geographic, "portable number" NPA/SAC codes to be routed through an SSP tandem and does not directly affect end office to/from end office high usage trunking for non-portable numbers. However, the GTE plan has other limitations as noted elsewhere in this report.

<sup>11</sup> This "tandem facility" may, in fact be an SSP-equipped access- or local tandem, or it may be the former end office destination for an NPA-NXX code now involved in portability equipped with either an RCF or SSP-tandem functionality.

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time available when using Type 2B trunking before SS#7-based portability was made available. The Type 2B -through- "tandem" economic scenario must also be compared to the additional cost to the CMRS provider of routing all traffic via Type 2A (tandem) trunking, and the additional cost to the tandem provider for the sheer bulk of supplemental facilities needed to handle such traffic.

While the above discussion focuses upon CMRS providers, very similar difficulties exist for any LEC using a non-SS#7 end office with numbers not ported from that end office, but with direct trunking to a switching entity providing portable numbers.<sup>12</sup>

It is correct to conclude from the above that significant reconfiguration of the PSTN will be engendered by number portability, and that a large portion of that reconfiguration will occur within local connectivity and trunking conventions. It is also correct to conclude that significant cost shifts will occur between various PSTN sectors.

CMRS Type 1 trunking concerns:

CMRS Type 1 interconnection, that is interconnection of a wireless exchange service system to the PSTN through another exchange service provider's (typically an LEC's) end office, should still be "technically" available under universal number portability. Type 1 interconnection will obligate a CMRS exchange service provider to make all network and number arrangements through its connecting end office company rather than directly with network administrators, and to concur in the number portability policies and practices of the end office company.

Type 1 interconnection is significantly different from the line-side interconnections which many new competitive LECs (C-LECs) are seeking for "resale-based" local service competition.

Of further concern, particularly with universal number portability and Type 1 interconnection, is coordinating and maintaining workable mapping between portable ten-digit personal addresses, fixed physical addresses including line identities, and (DID-type) addressing between the Type 1 serving end office and the wireless switch, especially in the situation noted in the following paragraph.

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<sup>12</sup> Although seemingly a bit on the obvious/absurd side, if a situation exists where numbers are ported from an NPA-NXX being used within a non-SS#7 end office (CMRS or LEC), then calling to any of the ported numbers/blocks will necessarily pass from that office to an SSP-tandem facility from which point a destination routing will be established.

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Interestingly, it is quite unclear whether an end-user of wireless service, who historically has enjoyed assignment of and association with a unique network address, namely his Type 1 telephone number, under portability can arguably adopt that network address as "his" personal address, which then becomes subject to "his" portability decisions, overriding the portability desires/policies/decisions of the wireless provider who, in fact "bought" and pays the end office company for that number as a customer.

CLASS functions and derivatives, considerations:

The family of CLASS functions, in its now-"conventional" IN/AIN definition, relies heavily upon one's telephone number and the association of that number both with one's personal identity and location identity. 9-1-1 service, and particularly E-9-1-1 service also rely on this association. Under portability a "telephone number" becomes one's personal address. Hardware equipment identities will become associated with physical addresses.

Current definitions of Caller ID and ANI, including that associated with 9-1-1/E-9-1-1<sup>13</sup>, may be adversely affected by any environment which dissociates one's personal address from the physical address associated with caller. When a call is placed using the line equipment designated by the physical address, present Caller ID and ANI arrangements would provide the physical address identity rather than a personal address. To complicate matters even more, under full portability more than one personal address, or even no personal address at all might be associated with that physical address. Thus, either a personal address, especially for call-backs, or physical address, for screening and recognition, may alone be irrelevant or provide indeterminate identity information. This further implies that CLASS end users would encounter difficulties simplistically recognizing callers and especially using selective call blocking, forwarding or call-back functions which are currently dependent upon hardware ANI and "telephone numbers".

Other examples of potential CLASS adversities ... originating-switch-based call-back/retry functions may malfunction using a "first-DIP", "locally memorized" caller's physical address when a personal address is associated with real-time "follow-me" PCS service. Addressed-user destination change data may have propagated to the relevant SCP, but would not be reverse-propagated to an end office switch with pending traffic.

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<sup>13</sup> Conventionally, 9-1-1 service has not included an ANI/ALI functionality at the subscribing public safety agency. However, to simplify discussion, and to reflect the trend toward E-9-1-1 functionality for all emergency reporting systems, ordinary 9-1-1 capabilities will be combined with those of E-9-1-1.

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In short, it is possible that some "present definitions" for CLASS functions may become "user-unfriendly" in almost any full portability environment. Some reorientation of CLASS definitions, and for that matter most network definitions, appears inevitable. Obviously, serious further investigation is required.

Overall, since there would no longer be a "fixed" one-on-one relationship of called telephone number/personal address and called equipment identity/physical address, or calling equipment identity/physical address and any particular personal address, the potential for difficulties and/or ambiguities throughout the network must be considered.

These difficulties with number portability and CLASS functions also are indicative of adverse effects upon more conventional network operations such as ANI, as already noted 9-1-1/E-9-1-1, and/or raw billing data interchange between carriers in either SS#7-based or pre-SS#7 networks. For example, in any reasonable number portability environment, "complete" raw data for call billing, say between any exchange service provider and an IXC, must include calling physical address (originating line equipment identity, for determination of originating location and rate center data), calling personal address (if available, for personal identity), called personal address (who one wishes to communicate with) whether or not a DIP is made, and if known, called physical address (the DIPped physical data for call rating). These effects apply both to older networks with circuit associated address and supervisory signaling, and the SS#7-based IN and AIN networks now evolving.

CMRS services must be cognizant of probable CLASS and 9-1-1/E-9-1-1 interactions under both fully participative number portability and for situations where CMRS may be exempt from direct provision and/or acceptance of portable numbers. Definition of how CMRS numbering and identities, including MINs (mobile identification numbers), IMSIs (international mobile station identification), and non-user-specific physical addresses integrate with number portability has yet to be fully resolved.<sup>14</sup> IS-41-type addressing systems, which utilize augmented subsets of SS#7 signaling to contact roaming subscribers and to ascertain/verify account and caller identity veracity, will definitely require close review for potential interactions and proper interpretation of both originating and received CLASS-associated data.

9-1-1 and E-9-1-1 services:

As noted in the CLASS section above, 9-1-1/E-9-1-1 relies very heavily upon the correlation of personal address and physical address to enable its caller identification and

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<sup>14</sup>

See also discussion of 9-1-1/E-9-1-1 for additional detail pertinent to CMRS.

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jurisdictional/PSAP (public safety answering point) selection and routing functions. The dissociation of personal and physical addresses, itself an issue of substantial magnitude for number portable fixed telephones, is compounded for CMRS providers.

The physical address associated with a CMRS based 9-1-1/E-9-1-1 caller is actually a moving target which is particularly unsuitable for any form of database ascertainment. If any useful location identity is to be provided at all, it must first be calculated by the CMRS infrastructure and relayed to the PSAP in real time. ANI is typically completely irrelevant to the location of the caller. For Type 1-interconnected CMRS providers, LECs typically provide the ANI of the serving TWLT (trunk with line treatment) in the LEC's end office, and conventional ALI returns a street address correlating to the CMRS/LEC interface location. Type 2-interconnected CMRS providers typically provide as the ANI, the MIN (mobile identification number) of the calling mobile user. The MIN cannot itself represent the mobile user location which is, of course, dynamic. Use of the MIN introduces further complications in the case of CMRS systems with wide area coverage or in situations involving itinerant (roaming) mobile users. Either of these user types carry identities associating them with localities far removed from the jurisdiction of the public safety agency receiving the call.

Fortunately, since CMRS paging is a one-way terminating service and cannot initiate a call, 9-1-1/E-9-1-1 issues are not immediately applicable to it.

In the two-way/cellular/ESMR/PCS environments, establishing vehicle location is itself a difficult undertaking. Forwarding the calculated location to the PSAP and de-coding it in a nationally compatible, useful and meaningful manner is yet another. The FCC has an open Docket inquiring into, among other things, extant and future 9-1-1/E-9-1-1 location ascertainment capabilities of CMRS systems. The one certain consideration is that number portability in the CMRS area is of secondary importance to the actual geophysical location of the caller which must, in any event, be ascertained/calculated by the CMRS system independent of any personal address or PSTN-routing-oriented, number portability dependent equipment physical address.

Determination of charges for calls:

The dissociation of the ten-digit NANP from personal address (telephone number) from a fixed destination/point of origin/physical address in the PSTN creates difficulties with respect to determination of call charges based solely upon the calling and called telephone numbers. Specifically, the ten-digit personal address can no longer singularly represent a call participant's rate center or be the primary determinant for call charges.

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Competition for both intraLATA toll as well as the more familiar interLATA long distance traffic will likely result in different IXC/toll carriers/providers deploying differing call charge structures. If traditional number by number, call by call rating remains appropriate, call accounting records would require, in addition to the specific identity of the caller, inclusion of both the destination physical address of a call, plus the physical address of the caller to enable distance-based rate application. An alternative would require SS#7 call progress data to provide an individually calculated rate-mileage figure or an actual rate assessment for each call accounting record. In general, the competitive marketplace will probably see competing providers each having their own charging algorithm which will in some manner rely on raw time and points of origin and destination as determinants.

Another consideration centers on the degree of importance attached to real-time caller notification of charge imposition. In many jurisdictions, indication of "long distance", but not necessarily message or measured rate,<sup>15</sup> charges for a call is associated with required dialing of the leading digit "1". Other jurisdictions are not concerned with the "charge" indication. Exchange service providers in those areas utilize the leading "1" simply to indicate that ten additional digits will follow the "1", and many even complete calls dialed as "1" plus ten digits which ordinarily should use seven digits or ten digits without the leading "1". If the leading dialed digit was other than a "1" (or "0"), only six additional digits were to follow and the call would be handled as a seven-dialed-digit "home area code" call. The home area code is the first three digits of conventional NANP telephone numbers.

Regulators and service providers alike will need to examine and quantify the advisability and/or necessity of having the charge assessing carrier provide, supplementary to required-use/absence of leading digit "1", verbal and/or audible and/or electronic signal advice to callers of the applicability and possibly the level of charges to and/or identity of the call's destination.

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<sup>15</sup>

Usage charges for message telephone service may be classified ...

- Toll/long distance - usually a per minute charge based upon duration of a call and the straight-line rate center to rate center distance which the call traverses. Within state toll or interstate regulatory jurisdiction.
- Measured rate - usually a per minute charge based upon duration of a call and the straight-line rate center to rate center distance which the call traverses. Within the local regulatory jurisdiction.
- Message rate - non duration sensitive, but sometimes rate center to rate center distance sensitive, per-call charge. Within the local regulatory jurisdiction.

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### Consumer dialing patterns:

In virtually any long-term, fully portable number environment, ubiquitous ten-digit dialing will, eventually become a necessity. This requirement is caused in part by dissociation of the calling telephone from an "easily user discernible" physical address and thus dissociation from an "easily user discernible" home area code (HNPA) default for seven-digit dialing, and in part by singular communities of interest now routinely circumscribing, and in more than a few cases co-mingling, multiple area codes.

In those portability areas where a leading "1" was simply a ten-digit indicator, under ten-digit dialing, need for the "1" is obviated. However, in areas still regarding "1" as indication of toll charges, call-by-call analysis of the physical address associated with the complete ten-digit called personal address is required to ascertain the "necessity" of the leading "1". The need to analyze the complete ten-digit personal address promotes inefficiencies. It will either negate the effectiveness of "anticipatory" dialed digit processing presently utilized in the PSTN to minimize post-dialing delay, or require equipage of additional digit analysis equipment to handle calls which ultimately will be rejected solely for inappropriate lack or presence of the leading "1".<sup>16</sup>

Fortunately, for consumer convenience, there is no mandate to forthwith abandon seven-digit dialing patterns as long as convenience has not yielded the floor to confusion.

### Number conservation and area code relief:

A properly designed long-term telephone number portability plan can significantly enhance a numbering administrator's ability to substantially improve upon present NANP

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<sup>16</sup> In the interests of network efficiency and consumer convenience, especially for the traveling, fixed telephone using, computer/fax-toting public, establishment of a simple, uniform, easy-to-remember national dialing convention is recommended. Any call to a valid ten-digit number dialed with a leading "1" should be completed ***regardless*** of its status as toll, local-free/flat, message rate, or measured rate. Consumers will not object to the absence of charges on "1+"-dialed calls. Non-toll calls may still be handled without a leading "1", thereby continuing to provide consumers a definitive indication of no toll charges. Maximizing "1+10d"-dialed call completions reduces network clutter from non-revenue, non-substantive, purely "cosmetic" announcements and technically unnecessary re-dials. It also avoids frustrating the traveling consumer who must figure out, often in a knowledge vacuum over increasingly complex 'tele-geography', "what area code is this", "local or toll", and "seven (7d), eight (1+7d), ten (10d), or eleven (1+10d) digits" to dial.



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code conservation measures and number use efficiencies by enabling the administrator to achieve "complete" fill of all active NPA-NXX codes.

Within the NANP as it is administered today, a particular (rural) rate center / switching entity may serve only a very few (e.g.: <100) access lines but still requires dedication of a full 10000 number NPA-NXX central office code. Under a well-designed version of portability, the fallow portions of formerly dedicated but lightly used NPA-NXX codes can be used elsewhere in a (state) portability domain. As noted above, there is likely to be a degree of "locale/number dissociation" experienced with full portability and full number utilization.

Full, universal, and ubiquitous number portability may, however, have deleterious effects for present accounting and security/anti-fraud practices associated with CMRS numbers and roaming services. A well-researched balance between number deployment, code relief, and conservation measures on the one hand, and on the other hand the security and fraud counter-measures integral to CMRS services, especially roaming services, must be fully understood, and implemented before number portability involving CMRS providers is undertaken. Note further that CMRS paging providers are less vulnerable than CMRS two-way/cellular/ESMR/PCS providers.

**Comparison of overviewed points, long term:**

This section will be presented in outline form. The relevant characteristics of the proposals of each of the four primary portability system proponents<sup>17</sup> will be shown for each substantive heading used in the overview of proposal considerations, above. Where and when appropriate, a brief summary and/or preference ranking is included at the end of each tabulation on the line labeled "Sum."

**Dimensions of customer number portability:**

All plans consider incumbent LEC exchange areas as interim portability limit. Long-term portability areas defined by "portability domain boundaries", below.

Sum. Interim and long term limitations on portability appear reasonable.

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<sup>17</sup> Proponents and associated abbreviations ...  
AT&T AT&T Corp.  
MCI MCI Telecommunications Corporation  
GTE GTE Service Corporation  
USIN U. S. Intelco Networks, Inc.